

REMARKS

The above amendments to the specification, claims and abstract have been made to place the application in proper U.S. format and to conform with proper grammatical and idiomatic English. None of the amendments herein are made for reasons related to patentability. No new matter has been added.

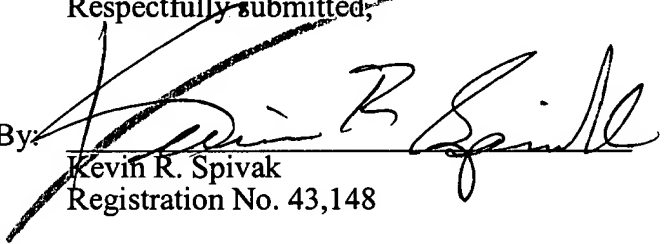
Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made".

In the event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 449122001400. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

For the convenience of the Examiner, the changes made are shown below with deleted text in strikethrough and added text in underline.

In The Specification:

Page 1, before the first paragraph, has been amended to include the following insert:

This application claims priority to International Application No. PCT/DE99/01849 which was published in the German language on December 29, 1999.

Page 1 before the first paragraph, please delete the following:

~~Description~~

Page 1, between lines 4 and 5 has been amended to include the following heading:

TECHNICAL FIELD OF THE INVENTION

Please replace the paragraph beginning on page 1, line 5, with the following rewritten paragraph:

The invention relates to ~~a method as claimed in the preamble of claim 1. Such a method is known, for example, from DE 44 06 720 C2~~ reduction of data traffic and in particular, to the reduction of data traffic between track bound vehicles and devices along a traveled route.

Page 1, between lines 7 and 8 has been amended to include the following heading:

BACKGROUND OF THE INVENTION

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Please replace the paragraph beginning on page 1, line 8, with the following rewritten paragraph:

Railway operations are usually controlled and monitored using signal cabins which ensure the safety of the railway traffic. To do this, the signal cabins use a very wide range of track sensors to monitor the locations of the trains moving in the area which they control, and ensure, by means of light signals, that successive trains do not come dangerously close to one another. In addition, signal cabins are used to switch routes for the trains, opposing moves or slanting moves being reliably avoided by means of exclusion and logic-linking procedures. The trains automatically release the parts of the route which they have cleared behind them and ~~thus make said~~ make these parts of routes available again for the controlling and monitoring signal cabin.

Please replace the paragraph beginning on page 1, line 22, with the following rewritten paragraph:

~~Such signal~~ Signal-cabin-controlled railway operations are appropriate to use on routes along which a ~~multiplicity of~~ multiple trains are intended to travel with the greatest possible density and at the highest possible speed. Signal ; ~~signal~~ cabins are indispensable for controlling railway traffic on main routes. However, they require a system on the tracks for determining the position of the vehicles and a centralized system for signaling proceed aspects or travel instructions to the trains.

Please replace the paragraph beginning on page 1, line 31, with the following rewritten paragraphs:

In order to limit the expenditure involved in determining the locations of the trains and signaling travel instructions, decentralized train protection systems, which permit safe journeys without the use of signal cabins (~~Signal + Draht, supplement 4/96, pages 22 to 27~~) have recently

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been preferred for routes with moderate traffic. In these decentralized train protection systems, the trains traveling along the route determine their respective location ~~themselves~~ and transmit ~~said the~~ location to decentralized devices along the route. ~~These, for which devices the term track area elements have been coined.~~ These devices are commonly referred to as track area elements.

Devices along the route are preferably assigned to ~~the switches.~~ They switches and are addressed by the trains by means of ~~telegrams with which the~~ telegrams. The trains register with ~~said devices~~ their request to be allowed to travel along the route with the devices using telegrams. The devices along the route check whether there are already applications for opposing moves in the respective route section or whether approvals have already been given for such moves. If this is the case, the request by the vehicle ~~which wishes~~ wishing to travel along the route cannot be granted, in which case a message to this effect is transmitted to the requesting ~~vehicle, and said~~ vehicles. The vehicle must subsequently stop ~~at the latest at~~ no later than the point on the route up to which it still has permission to move forward. However, if at the time ~~when~~ a train makes a request to a device along the route there has not been any request to ~~said the~~ device to assign the route which it administers, ~~or parts of said route,~~ (or parts of the route) to a train which is moving forward in the opposite direction, and if a corresponding approval to travel along the route in the opposite direction has not been granted, the device along the route accepts the request originating from the train and ~~assigns to said train permission~~ assigns permission to the train to travel along the route which it administers; ~~a precondition for this is, however,~~ administers. A prerequisite is that the permission to travel along the route has not already been assigned to a train located ahead of ~~said the~~ train or that an older request for the assignment of permission to travel along the route is present from there. Permission to travel along the route administered by a device along the route can only ~~ever~~ be assigned to just one train by each of ~~said the~~ devices along the route; route, a following train cannot travel on the route until the train ahead has completely cleared the route. Opposing moves on the route are not

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possible until all the trains traveling on this route in the assumed direction have cleared the route administered by the device along the route. ~~For the sake of simplification, in~~ In the statement above it has been assumed that between the trains moving in the assumed direction of travel toward the devices along the route there are no branches at which, for example, following trains can leave the track on which more than one train is traveling.

Please replace the paragraph beginning on page 3, line 9, with the following rewritten paragraph:

~~The vehicles which are~~ Vehicles moving along the route determine ~~themselves~~ their respective location along the route, for example using GPS systems, and transmit to the devices along the route appropriate location messages from which ~~said~~ devices can determine whether the route sections locked out for the trains are still being traveled along or have already been cleared. In the latter case, a request by another train for assignment of permission to travel along the respective route can then be processed, and, if appropriate, granted. The devices along the route have sufficiently precise information on the location of the route sections occupied by the individual trains if, in addition to appropriate locating information being transmitted by the trains, it is also certain that the trains are complete (i.e. include their usual number of cars). The trains must check this complete state continuously or at least at predefined chronological or spatial intervals and either transmit appropriate messages to the devices along the route or include these messages in the location messages in some suitable way. The devices along the route then take into account, for the protection of the route, either the actual length of the trains or else they take into account standardized length values.

Please replace the paragraph beginning on page 3, line 33, with the following rewritten paragraph:

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In order to, if appropriate, make multiple requests for permission to travel along certain route sections, to continuously transmit permission messages to the vehicles and to continuously transmit location messages so that route sections which have already been cleared are made available at an early point, it is necessary to have very intensive data traffic between the trains and the devices along the route. This data traffic becomes more complex ~~as the greater~~ the number of vehicles or trains passing through the route per time unit increases, the more frequent the updating of the location messages and the greater the precision with which the route is to be subdivided in a virtual fashion in order to maintain intervals between successive trains.

Page 4, between lines 9 and 10 has been amended to include the following heading:

SUMMARY OF THE INVENTION

Please replace the paragraph beginning on page 4, line 10, with the following rewritten paragraph:

~~The object of the~~ The invention is to reduce the data traffic between the trains traveling along a route and the devices along the route for protecting railway operations.

Please replace the paragraph beginning on page 4, line 14, with the following rewritten paragraph:

~~The invention achieves this object by means of the characterizing features of claim 1. In~~ one embodiment of the invention, there is a method for reducing the data traffic between track-bound vehicles traveling along a route and devices along the route. The method includes, for example, registering a vehicle request to be allowed to travel along the route. The vehicles are assigned permission to travel along the route according to predefined rules, the vehicles determining their respective location wherein the vehicles traveling ahead are moved closer to vehicles behind up to their braking distance. The vehicles are virtually coupled and move

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forward together, but independently of one another, using a vehicle-mounted distance-maintaining system. The devices along the route treat the virtually coupled vehicles as a single vehicle train whose front is determined by the front vehicle of the vehicles which were previously traveling ahead and whose rear is determined by the rear vehicle of the vehicles which were previously traveling behind. According to said features, successive trains are virtually coupled as required, with the result that the devices along the route ~~must now~~ exchange data, at least on a temporary basis, with, in each case, ~~just~~ at least a single train. The devices along the route continue to communicate with the virtual composite train, while the actual individual trains which are present monitor their train integrity and transmit appropriate messages to the train which is communicating with the devices along the route. The trains which are coupled virtually are themselves responsible for maintaining a safe distance between each other, and the distance can be kept relatively small using, for example, radar sensors or else may be, for example, of the order of magnitude of 500 m or more. Virtual coupling of trains which are spaced apart to this extent may be appropriate, for example, if the rear train cannot contact the device along the route for whatever reasons.

On page 4, please delete lines 34-36.

~~Advantageous refinements and developments of the method according to the invention are given in the subclaims.~~

Please replace the paragraph beginning on page 5, line 1, with the following rewritten paragraph:

In one aspect of the invention, more than two successive vehicles/vehicle trains can be coupled to form a virtual composite vehicle train. The method ~~according to the invention as claimed in claim 2~~ can also advantageously ~~also~~ be used in an approach in which in each case

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more than two trains are virtually coupled to one another and treated in each case as one train by the devices along the route.

Please replace the paragraph beginning on page 5, line 6, with the following rewritten paragraph:

In another aspect of the invention, train integrity checks are performed by the vehicles and appropriate messages are transmitted at least indirectly to the devices along the route. ~~According to the teaching of claim 3, the~~ The virtually coupled trains will supply the devices along the route at least indirectly with messages relating to the state of completeness of the virtually coupled ~~trains; this~~ trains. This permits the devices along the route to obtain reliable information on the location of the trains on the route, and thus on the occupation of the tracks.

Please replace the paragraph beginning on page 5, line 14, with the following rewritten paragraph:

In still another aspect of the invention, the braking distance, in addition to the relative braking distance of the successive vehicles or the absolute braking distance of the vehicles behind, safety supplements are taken into account at least for the confidence interval of the locating process, as well as data-transmission and data-acknowledgement times. If the aim is to allow trains to follow one another with the greatest possible density, the minimum distance values between the trains resulting from the braking distance ~~in accordance with the teaching of claim 4~~ should be increased with safety supplements which take into account the confidence interval of the locating process and velocity-dependent distance values for taking into account times for the transmission and acknowledgement of data.

Please replace the paragraph beginning on page 5, line 23, with the following rewritten paragraph:

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In yet another aspect of the invention, the virtual coupling of the vehicles is canceled and the devices along the route communicate with the individual vehicles. If the virtual coupling of the trains is to be canceled again, the devices along the route ~~must, according to the teaching of claim 5,~~ should communicate again with the individual vehicles or vehicle trains and evaluate separately the location messages originating from them.

Please replace the paragraph beginning on page 5, line 29, with the following rewritten paragraph:

~~In this respect, according to the teaching of claim 6, the~~ In another aspect of the invention, the vehicles communicating with the devices along the route inform the latter about the vehicles which are coupled to them virtually, and in that, in response to the detection of the cancellation of the virtual coupling the devices along the route again request at least separate location messages from the vehicles/vehicle trains following one another for the route sections along which they travel. In still another aspect of the invention, after the cancellation of the virtual coupling, the vehicles which have until now been coupled virtually report to the devices along the route and output at least separate location messages for the route sections along which they travel. The devices along the route will request separate transmission of location messages, or else, according to the teaching of claim 7, the vehicles will of their own accord transmit these location messages to the route devices after the virtual coupling has been canceled.

Please replace the paragraph beginning on page 6, line 3, with the following rewritten paragraph:

In yet another aspect of the invention, the virtual coupling of the vehicles is performed or canceled by the vehicles. The virtual coupling of the vehicles ~~according to the teaching of claim 8~~ is advantageously performed and canceled again by the vehicles because the devices

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along the route are intended to be used primarily to ensure safety but not to perform logistical measures.

Please replace the paragraph beginning on page 6, line 8, with the following rewritten paragraph:

In still another aspect of the invention, the virtual coupling is canceled when faults are detected in the distance-maintaining system. The virtual coupling of trains is intended, ~~according to the teaching of claim 9,~~ to be canceled in particular when faults occur in the distance control system because, given faulty distance control, it is no longer ensured that the successive vehicles do not indeed come dangerously close to one another. When the virtual coupling is canceled, which is possible at any time, the devices along the route are again presented with completely separate trains which are to be treated separately.

Page 6, between lines 17 and 18 has been amended to include the following heading:

BRIEF DESCRIPTION OF THE DRAWINGS

Page 6, between lines 24 and 25 has been amended to include the following heading:

DETAILED DESCRIPTION OF THE INVENTION

On page 13, line 1, please replace "Patent Claims" with --WHAT IS CLAIMED IS--

In the Claims

Please amend the claims as follows.

1. (Amended) A method for reducing the data traffic between track-bound vehicles traveling along a route and devices along the route, comprising: ~~in which the vehicles register their~~

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registering a vehicle request to be allowed to travel along the route;
and ~~the vehicles are assigned~~ assigning permission to vehicles to travel along the route according to predefined rules, the vehicles determining their respective location ~~themselves~~, ~~characterized in that~~ wherein the vehicles (Z1) traveling ahead are moved closer to ~~following~~ vehicles (Z2) behind up to at ~~most~~ their braking distance (~~BA2~~),
~~in that~~ wherein the vehicles (Z1, Z2) are ~~then~~ virtually coupled,
~~in that~~ wherein the virtually coupled vehicles move forward together, but independently of one another, using a vehicle-mounted distance-maintaining system (AS),
and ~~in that~~ the devices (E) along the route ~~then treat them~~ the virtually coupled vehicles as a single vehicle train whose front is determined by the front vehicle of the vehicles which were previously traveling ahead and whose rear is determined by the rear vehicle of the vehicles which were previously traveling behind.

2. (Amended) The method ~~as claimed in~~ according to claim 1, ~~characterized in that~~ wherein more than two successive vehicles/~~vehicle trains~~ can be coupled to form a virtual composite vehicle train.

3. (Amended) The method ~~as claimed in~~ according to claim 1, ~~wherein or 2,~~ ~~characterized in that~~ train integrity checks are performed by the vehicles and appropriate messages are transmitted at least indirectly to the devices along the route.

4. (Amended) The method ~~as claimed in~~ according to claim 1, ~~wherein or 2,~~ ~~characterized in that~~ for the braking distance, in addition to the relative braking distance of the successive vehicles or the absolute braking distance of the ~~following~~ vehicles behind, safety supplements are taken into account at least for the confidence interval of the locating process, as well as data-transmission and data-acknowledgement times.

5. (Amended) The method ~~as claimed in~~ according to ~~one of claims 1 to 4,~~ ~~characterized in that~~ claim 1, wherein the virtual coupling of the vehicles is canceled ~~again if necessary, whereupon~~ and the devices along the route communicate with the individual ~~vehicles/vehicle trains again~~ vehicles.

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6. (Amended) The method ~~as claimed in~~ according to claim 5, characterized in that wherein the vehicles communicating with the devices along the route inform the ~~latter~~ devices about the vehicles which are coupled to them virtually, and ~~in that~~, in response to the detection of the cancellation of the virtual coupling, the devices along the route again request at least separate location messages from the vehicles/~~vehicle trains following behind~~ one another for the route sections along which they travel.

7. (Amended) The method ~~as claimed in~~ according to claim 5, characterized in that, wherein after the cancellation of the virtual coupling, the vehicles previously ~~which have until now been~~ coupled virtually report to the devices along the route and output at least separate location messages for the route sections along which they travel.

8. (Amended) The method ~~as claimed in~~ according to claim 1, wherein one of ~~claims 1 to 7, characterized in that~~ the virtual coupling of the vehicles is performed or canceled by the vehicles.

9. (Amended) The method ~~as claimed in~~ according to claim 5, wherein one of ~~claims 5 to 8, characterized in that~~ the virtual coupling is canceled when faults are detected in the distance-maintaining system.

In the Abstract:

Please replace the Abstract in its entirety with the Abstract attached hereto.

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